

$\Upsilon(4S)$ or $\Upsilon(10580)$
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$$I^G(J^{PC}) = 0^-(1^{--})$$

$\Upsilon(4S)$ MASS

VALUE (GeV)	DOCUMENT ID	TECN	COMMENT
10.5800±0.0035	¹ BEBEK	87 CLEO	$e^+e^- \rightarrow$ hadrons
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
10.5774±0.0010	² LOVELOCK	85 CUSB	$e^+e^- \rightarrow$ hadrons
¹ Reanalysis of BESSON 85.			
² No systematic error given.			

$\Upsilon(4S)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
14 ±5 OUR AVERAGE	Error includes scale factor of 1.7.		
10.0±2.8±2.7	³ ALBRECHT	95E ARG	$e^+e^- \rightarrow$ hadrons
20 ±2 ±4	BESSON	85 CLEO	$e^+e^- \rightarrow$ hadrons
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
25 ±2.5	LOVELOCK	85 CUSB	$e^+e^- \rightarrow$ hadrons
³ Using LEYAQUANC 77 parametrization of $\Gamma(s)$.			

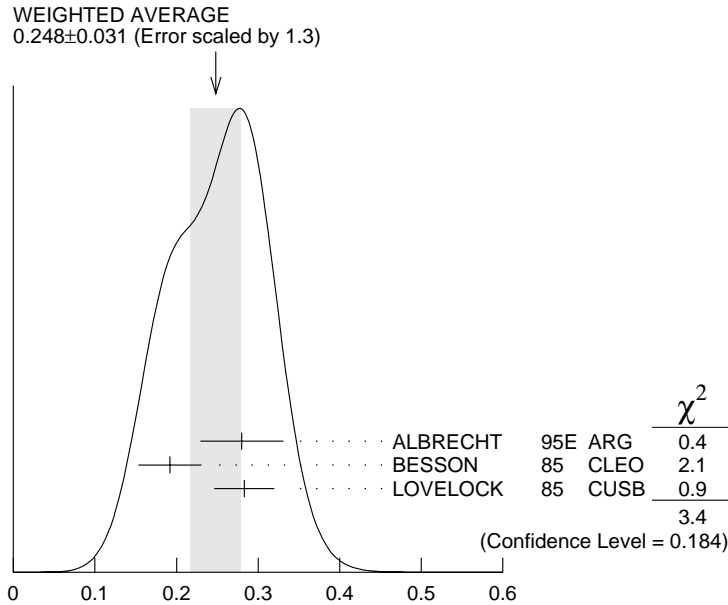
$\Upsilon(4S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 $B\bar{B}$	> 96 %	95%
Γ_2 non- $B\bar{B}$	< 4 %	95%
Γ_3 e^+e^-	$(2.8\pm0.7) \times 10^{-5}$	
Γ_4 $J/\psi(3097)$ anything	$(2.2\pm0.7) \times 10^{-3}$	
Γ_5 D^{*+} anything + c.c.	< 7.4 %	90%
Γ_6 ϕ anything	< 2.3 $\times 10^{-3}$	90%
Γ_7 $\Upsilon(1S)$ anything	< 4 $\times 10^{-3}$	90%
Γ_8 $\Upsilon(1S)\pi^+\pi^-$	< 1.2 $\times 10^{-4}$	90%
Γ_9 $\Upsilon(2S)\pi^+\pi^-$	< 3.9 $\times 10^{-4}$	90%

$\Upsilon(4S)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$	DOCUMENT ID	TECN	COMMENT	Γ_3
0.248±0.031 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.			
0.28 ±0.05 ±0.01	⁴ ALBRECHT	95E ARG	$e^+e^- \rightarrow$ hadrons	
0.192±0.007±0.038	BESSON	85 CLEO	$e^+e^- \rightarrow$ hadrons	
0.283±0.037	LOVELOCK	85 CUSB	$e^+e^- \rightarrow$ hadrons	

⁴ Using LEYAOUANC 77 parametrization of $\Gamma(s)$.



$\Gamma(e^+ e^-)$ (keV)

$\Upsilon(4S)$ BRANCHING RATIOS

$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
$2.77 \pm 0.50 \pm 0.49$	⁵ ALBRECHT	95E ARG	$e^+ e^- \rightarrow$ hadrons

⁵ Using LEYAOUANC 77 parametrization of $\Gamma(s)$.

$\Gamma(J/\psi(3097)\text{ anything})/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
$0.0022 \pm 0.0006 \pm 0.0004$	ALEXANDER	90C CLEO	$e^+ e^-$

$[\Gamma(D^{*+}\text{ anything}) + \Gamma(\text{c.c.})]/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 0.074	90	⁶ ALEXANDER	90C CLEO	$e^+ e^-$

⁶ For $x > 0.473$.

$\Gamma(\phi\text{ anything})/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 0.0023	90	⁷ ALEXANDER	90C CLEO	$e^+ e^-$

⁷ For $x > 0.52$.

$\Gamma(\Upsilon(1S)\text{anything})/\Gamma_{\text{total}}$			Γ_7/Γ		
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.004	90	ALEXANDER	90C	CLEO	e^+e^-

$\Gamma(\Upsilon(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$			Γ_8/Γ		
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.2	90	GLENN	99	CLE2	e^+e^-

$\Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$			Γ_9/Γ		
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<3.9	90	GLENN	99	CLE2	e^+e^-

$\Gamma(\text{non-}B\bar{B})/\Gamma_{\text{total}}$			Γ_2/Γ		
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.04	95	BARISH	96B	CLEO	e^+e^-

$\Upsilon(4S)$ REFERENCES

GLENN	99	PR D59 052003	S. Glenn <i>et al.</i>	(CLEO Collab.)
BARISH	96B	PRL 76 1570	B.C. Barish <i>et al.</i>	(CLEO Collab.)
ALBRECHT	95E	ZPHY C65 619	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALEXANDER	90C	PRL 64 2226	J. Alexander <i>et al.</i>	(CLEO Collab.)
BEBEK	87	PR D36 1289	C. Bebek <i>et al.</i>	(CLEO Collab.)
BESSON	85	PRL 54 381	D. Besson <i>et al.</i>	(CLEO Collab.)
LOVELOCK	85	PRL 54 377	D.M.J. Lovelock <i>et al.</i>	(CUSB Collab.)
LEYAOUANC	77	PL B71 397	A. Le Yaouanc <i>et al.</i>	(ORSAY)

OTHER RELATED PAPERS

HENDERSON	92	PR D45 2212	S. Henderson <i>et al.</i>	(CLEO Collab.)
ANDREWS	80B	PRL 45 219	D. Andrews <i>et al.</i>	(CLEO Collab.)
FINOCCHI...	80	PRL 45 222	G. Finocchiaro <i>et al.</i>	(CUSB Collab.)